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anthracnose, oidium, and other fungi, together with suggestions for their treatment; also a formidable list of insect enemies to the vine and its fruits; and an appendix treating of the adaptation of American vines to soils.

Altogether this work of the distinguished botanist is of standard interest, and in its preface we have the assurance that it will be soon followed by a second volume, wherein Viala will record personal observations made in travel through our country, and also "Studies upon Viticulture and Vinification in the United States." The volume under consideration is of especial interest to scientists; the volume to come will surely be instructive to the practical student of viticulture and viniculture.—A. W. PEARSON.

WAKKER, J. H. Contributions a la pathologie végétale: (1) *La morve des Anémones, produite par le Peziza tuberosa,* Bull.*;* (2) *Nouvelle recherches sur la gommose des Jacinthes et plantes analogues ;* (3) *Les renflements des branches de quelques espèces de Ribes ;* reprint from *Archives Néerlandaises*, Tome XXIII, p. 373–400, with 2 plates on Gummosis.

(I.) The author completes some observations on a disease of anemones known as black rot, and due to *Peziza tuberosa.* This fungus occurs principally on *Anemone Coronaria,* its varieties and hybrids, these being the sorts most frequently planted. It has also been observed on *A. ranunculoides* and *A. nemorosa.*

The symptoms of the disease are essentially the same in all the species. The leaves turn brown, wither early, and pull up very readily. The root-stock is the part first attacked and the chief seat of the disease, but the base of the petioles may also become involved. In a normal condition the interior of the root-stock shows the milk-white color of ordinary starch-bearing parenchyma, but under the influence of this fungus it assumes a gray tint, and becomes soft and easy to crush between the fingers. Large mycelial filaments penetrate this soft mass in all directions, passing between the cells and through them. These filaments were traced into the firm tissues of the rhizome. There their very blunt extremities are found only between the cells, the filaments, as in many other cases, growing around and between the cells before determining their destruction.

When the diseased plants are left undisturbed in the earth, the mycelium produces large sclerotia, easily mistaken for the root-stocks of *A. coronaria,* a fact which singularly favors the spread of the fungus.

Toward the end of April these sclerotia begin to produce the ordinary *Peziza* cups. These are a uniform milk and chocolate color, 55 mm long; 3 mm thick; with a disk breadth of 15 mm. Some other measurements are: asci, 190 x 12 μ.; paraphyses, 190 x 2 μ.; spores, 16 x 8 μ. For admirable figures of the *Peziza* form, see Tulasne *S. F. C.* III, Tab. 22, Figs. 1–5.

In the ascus, or in water, the spores send out long tubes within 24 hours, and produce sporidia in 48 hours, after which they perish. These sporidia occur in great numbers (see also Brefeld, IV., Pl. IX, Fig. 16–19), but are functionless. The case is otherwise on nutrient media. The author used a decoction of raisins, solidified by the addition of gelatine and sterilized by discontinuous heat. This substratum is easy to prepare and very suitable for the development of mucedineous facultative parasites. By germinating the ascospores on slides in drops of this gelatine and transferring the mycelium after four days to Van Tieghem cells, the bottoms of which were covered with gelatine, he obtained a most luxuriant growth, but no sclerotia during the whole life of the mycelium, which exceeded three months.

This fungus needs a start before it is strong enough to attack healthy tissues. Infection takes place by means of the mycelium, and hence, except in rare cases, it is possible only through the parts underground. Ascospores sown on fresh cuts of different rhizomes gave no results; but two rhizomes taken from the same pot were quickly infected (in four days) and destroyed with the usual symptoms, by bringing them into contact with some mycelium taken from one of the cell cultures. When the spores find their way into the soil, especially when they lodge on the posterior decaying end of the rhizone, they are undoubtedly in a condition favorable to robust growth, and have an excellent opportunity to attack the plant.

Dr. Wakker discusses the relation of *P. tuberosa* to *P. bulborum*, which attacks hyacinths and related *Liliaceæ* in the same locality. The chief difference lies in the size of most of the organs, those of *P. bulborum* being smaller. The spore measurements, however, are identical, so that he would be inclined to doubt the specific difference were not the conviction universal among horticulturists that the disease never passes from hyacinths to anemones, or inversely.

The ascus form is common in *P. tuberosa.* In the hyacinth disease, and other sclerotial diseases, the *Peziza* cups rarely develop. For this reason, and others, the author inclines to believe that *P. tuberosa* is the species truly indigenous to Central Europe and that *P. sclerotiorum* and *P. bulborum* are derivatives from this original stock, changed conditions having produced slight modifications, forming distinct but very closely related species.

(II.) The author is able to throw some additional light on the gummosis of the hyacinth. He has also discovered gummosis in the tulip and in *Tecophilea cyanocrocus.* A similar degeneration also occurs in *Ixia* bulbs (Dr. Masters) and in *Cyclamen* leaves (Prillieux).

The very small gum pockets in the substance of the inner scales of the hyacinth are pure white, and their walls are still composed of living cells. These pockets are not limited, however, to the youngest scales, but invade even the outermost tunics and are often large, the walls becoming dead and structureless and the gum exuding on the surface of the bulb in small drops. These superficial drops frequently contain mycelium, but, as in previous examinations, none could be found in any of the closed pockets, even by the most approved and delicate methods of section cutting and staining. A similar examination of tulip bulbs led to the same result. There is also no ground for belief that gummosis is due to the attacks of *Tylenchus.* Although Beyerinck found gummosis to be communicable in the *Amygdaleæ*, the author so far has not been able to produce it artificially in hyacinths. The moistened gum did not increase in quantity, or cause any gummy degeneration of surrounding tissues when put into wounds or on the cut surface of bulbs. From two experiments in which bulbs were kept for a long time in moist earth at a high temperature (30° to 37° C.), and from considerations published elsewhere, the author concludes that the stinking white rot of the bulbs is always preceded by gummosis. In conclusion he says:

> The little we know to-day on the subject of gum formation in bulbous plants may be summarized as follows:
>
> (1) The gum is found essentially either between the parenchyma cells of the scales or else between the epidermis and the parenchyma.
>
> (2) In the vicinity of a gum pocket the starch disappears from the parenchyma cells and is replaced by gum.
>
> (3) Those cells totally deprived of starch are not only completely alive, but may increase much in size and even divide tangentially.
>
> (4) In the cells which have died prematurely the starch remains unchanged.
>
> (5) Lining the greater part of the wall of cells, which surrounds the cavity, is a layer of gum of greater density (as shown by its yellow color) than that which occupies the center of the cavity.
>
> (6) Gummosis and the white rot are one and the same disease.
>
> (7) Of a parasitic cause there is no trace.

(III.) The author describes what he calls a *rhizomania* in species of Ribes, *i. e.*, a tendency in the branches to the formation of numerous, incipient, adventitious roots. These abnormal roots either do not pierce the bark or dry up and die as soon as they have done so, leaving only slight conical prominences. The result of these numerous growths is a hypertrophy and degeneration of various tissues, especially of the bark, with the formation of black or brown, rough and irregular, roundish or elongated tumors, having a diameter many times greater than that of the normal branch. Main stems, robust vertical branches, and shoots of the first year show no trace of these tumors, and where only a single root was formed the author observed no pathologic change.

These growths differ from the ordinary production of roots on branches in the following particulars: (1) The disposition of the roots appears to be entirely independent of the force of gravity or the direction of the light. (2) These roots also differ essentially in that their production is not restricted but goes on indefinitely to the formation of tumors. The author has been able to find in literature no mention of any analogous fact. In some respects the growths suggest "witch brooms," but the author could find no traces of any animal or vegetable parasite.—ERWIN F. SMITH.